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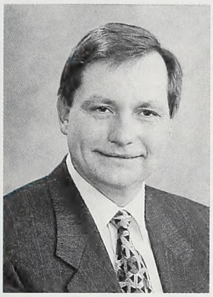
Aquaculture in Alberta

Issue One, Winter 1998

Minister Welcomes New Aquaculture Initiative



As Minister of Alberta Agriculture, Food and Rural Development, I'm pleased to have the opportunity to contribute to the department's first issue of *Aquaculture in Alberta*. The launch of this bulletin is indicative of good things to come in the aquaculture industry in Alberta.

This publication is designed to meet the needs of those who are directly involved in the aquaculture industry. The main thrust of the bulletin will emphasize the philosophy that ideas and technology should be discussed and exchanged. Most concepts that might seem simple and insignificant to some aquaculture producers often have significant worth to other aquaculture producers.

While the agriculture industry continues to evolve at a rapid pace, much of our agriculture knowledge is still based on family tradition, things our grandparents taught our parents who in turn taught us. However, aquaculture is an industry that starts with us, a new frontier for this region, one that we can develop and in turn pass that knowledge onto our children and grandchildren. Years from now, we will be considered the Canadian 'pioneers' of this industry.

As our relations with Asia continue to grow, so too will our knowledge of aquaculture. China, the traditional home of fish farming, is in need of Alberta expertise in the beef industry. Obviously there is great potential for an exchange of a wealth of information.

Fish farmers who are producing fish for a particular market must be prepared to spend time researching that market, identifying customers needs and developing marketing strategies while ensuring the protection of both the environment and our natural fish stocks. This doesn't have to be a lonely venture though. Alberta Agriculture, Food and Rural Development will continue to work with the industry to help develop markets and strategies. One example is the production of a sterile, disease-free grass carp, a joint cooperative announced just a few months ago at the Lethbridge Community College.

Production and marketing expertise in the development of aquaculture is sure to be a challenging yet rewarding experience for all involved. I'm sure *Aquaculture in Alberta* will go a long way in communicating many of the future developments and will provide timely information for those of you in the industry. While the traditional world fisheries continue to decline, Alberta aquaculture is poised to take up the slack.

Congratulations to those involved in this inaugural issue of *Aquaculture in Alberta* and to Alberta's aquaculture producers, all the best in an industry that is already showing great potential.

Ed Stelmach

Ed Stelmach,
Minister

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Alberta
AGRICULTURE, FOOD AND
RURAL DEVELOPMENT

Licencing Private & Commercial Fish Farmers

On April 1, 1997, licencing of all recreational and commercial fish culture sites in Alberta became the responsibility of Alberta Agriculture Food and Rural Development (AAFRD) under its Aquaculture Section. Legislative authority continues under the Alberta Fisheries Act, and is maintained by Alberta Environmental Protection.

Three licences are available from AAFRD:

- **Recreational**
- **Commercial A**
- **Commercial B**

Fish culture licences are in effect from the date of issue to the following March 31 and may not be transferred. Applicants for licences must be residents of Alberta.

Each new application site must be inspected, to ensure all licenced water bodies are safe environments for stocking cultured fish. "A safe environment," says Jack Stewart, head of the province's aquaculture licencing and inspection unit, "guarantees containment of fish to the licenced water body." The waterbody must also restrict public access and be surrounded by privately owned land to which the applicant has title or written permission to operate a fish culture site. Water bodies must be less than 259 contiguous hectares (640 acres).

A Recreational Fish Culture licence authorizes the holder to raise one or more of the species of cultured fish and their live eggs listed in the Fisheries (Alberta) Act. As of November 1, 1997, this list includes rainbow, brown, brook and tiger trout, arctic char and triploid grass carp. Recreational fish culture licenceholders cannot profit from fish sales.

The holder of a Commercial A Fish Culture Licence may raise those cultured fish listed for a Recreational licence. The licencee may sell the fish dead for the table or "U-fish" market, subject to the Public Health Act. If the fish are sold alive, they may only be sold to those persons authorized by licence to possess cultured fish. Special conditions apply to the rearing of triploid grass carp.

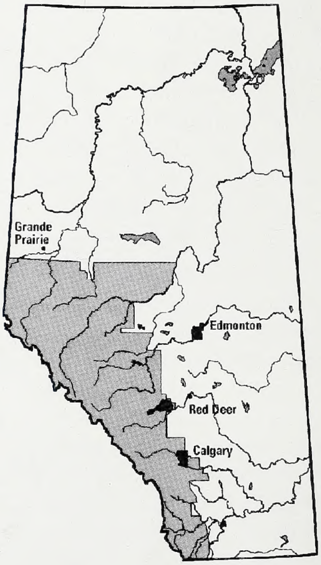
Restrictions also exist as to the species of cultured fish allowed to be stocked in certain geographical portions of Alberta. Although most of the province is open to stocking all allowable species, the eastern slopes of Alberta is **restricted** to stocking rainbow trout only. Any fish stocking is **prohibited** in lands drained by the Raven River, Stauffer Creek and the creek known locally as Beaver Creek.

The holder of a Commercial B Fish Culture Licence may raise Atlantic, chinook, coho and sockeye (kokanee) salmon, freshwater prawns, goldfish, koi and tilapia, including their live eggs, but only in contained waters. Contained waters are defined as indoor aquariums or man-made reservoirs that isolate the water from directly flowing into other water sources. They must be completely lined with impervious material and be no larger than 55.7 m^2 (600 feet^2) in surface area.

Cultured fish in this class may be sold, dead or alive, to another Commercial B Fish Culture Licence holder or to a premise that carries a food establishment permit. Commercial B Fish Culture licences are not allowed in the Restricted or Prohibited areas of Alberta.

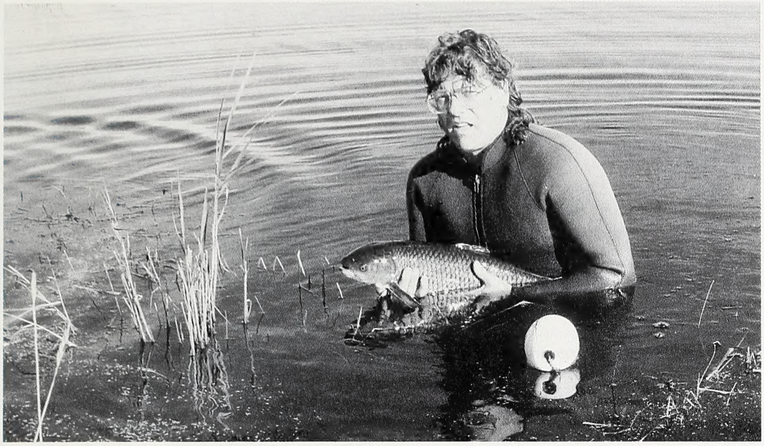
In an effort to reduce the inconvenience of annual renewals, the aquaculture section is proposing to increase the term of a recreational fish culture licence to five years. This proposal will hopefully be accepted in time for the 1998 season.

For more information on aquaculture licencing and legislation, contact Jack Stewart, head of licencing and inspection, Aquaculture Section, Animal Industry Division, Alberta Agriculture, Food and Rural Development, Lethbridge, Alberta, T1J 4C7. Telephone (403) 381-5164 or E-mail stewartj@gov.ab.ca



▨ **Restricted zone**

Note: black area around Red Deer is prohibited zone



Grass carp from a research dugout near Vegreville.

Grass Carp for Dugout Weeds

Aquatic Weed Control Carp Finally Hit Market

July 1, 1997, marked an important date for private industry and educational institutions. The Eastern Irrigation District (EID) and Lethbridge Community College (LCC) joined their organizations in a very unique partnership. The EID and LCC signed a five-year joint venture agreement that will provide triploid grass carp for sale to the public starting in the spring of 1998. The partnership is called Cooperative Aquaculture Research Project (C.A.R.P.).

"Grass carp are the first successful means of providing biological aquatic vegetation control in the province of Alberta," says Terry Schroeder, grass carp business manager with the Eastern Irrigation District. "This method of biological vegetation control provides an environmentally friendly alternative to traditional chemical control".

Research in the triploid grass carp project was initiated in the late 1980's by Alberta Agriculture, Food and Rural Development (AAFRD). The EID and LCC started to participate in the project in the early 1990's, providing funding and research facilities. The EID was originally interested in the project because it was possible the grass carp could provide weed control in irrigation canals. LCC's interest in the program would serve to enhance educational programs in the aquaculture area. The cooperation between AAFRD, EID and LCC has successfully brought the project forward to the present. Today, the public can enjoy a safe and environmentally friendly product for controlling aquatic weeds in water bodies.

Triploid grass carp can be used in most water bodies to control weeds that will cause water quality to deteriorate over time. "The fish, when properly stocked in ponds, will graze the weeds found in most Alberta water bodies," states Schroeder. Vegetation controlled in past studies included chara, Canada water weed, water plantain and various species of pond weeds.

The fish will provide effective control for their natural lives, estimated between eleven and fifteen years. The fish have proven effective in many regions of the province, from southern Alberta to the Peace River region. Types of water bodies that can utilize grass carp include farm dugouts, municipal water reservoirs, golf course water hazards, and acreage ponds. These can all benefit from the biological aquatic weed control that triploid grass carp can provide.

To provide a large quantity of high quality triploid grass carp, the EID and LCC are investing approximately $500,000 each in state-of-the-art indoor rearing facilities. LCC's role is to hold and spawn brood stocks and provide three-inch (80 mm) disease-free and triploid certified fish.

The EID's role is to raise the fish to the market size of ten inches and one half pound (250 mm and 250 grams) and then market and distribute the fish across Alberta.

Both the EID and LCC are in the process of constructing their respective facilities.

EID's facility, located in Brooks, will be operational by February 1, 1998. LCC's facility will be on line in the spring. The project's goal is to sell 50,000 fish in 1998. Production will double in 1999, and the full production of 160,000 fish per year will be reached by the year 2000.

"To purchase fish, your water body must be ready to receive them. It first has to be licenced by AAFRD, which involves an on site inspection by a qualified agent," adds Schroeder.

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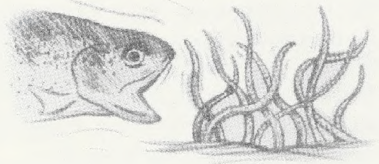


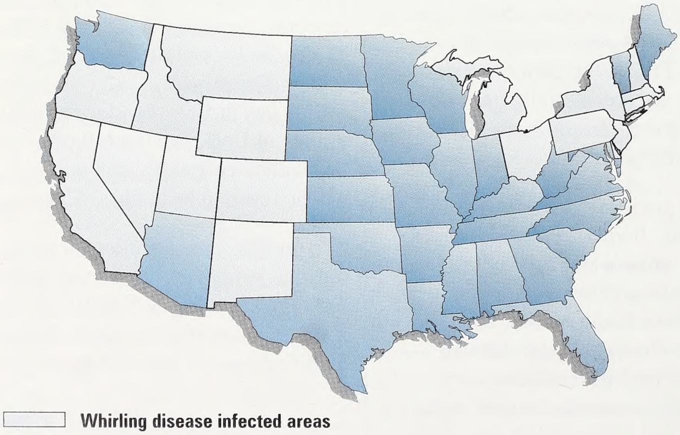
Whirling Disease

Alberta Environmental Protection closed the borders to imports of live salmonids (trout) effective October 1, 1997. This measure will minimize the risk of exposure of Alberta trout to whirling disease in the province's world-class trout fishery. The ban does not affect imports of salmonid eggs.

Whirling disease is caused by a microscopic parasite that attacks the cartilage of young trout and salmon. It is named for the erratic, tail-chasing or "whirling" behavior displayed by some young fish infected with the parasite. Though the parasite may not kill fish direcly, it makes them more vulnerable to disease and environmental distress, both of which can cause death. Infected fish can transfer the disease to new locations. Mud provides the medium for the parasite's intermediate host, the tubifex worm. Parasite spores can exist in mud for up to 30 years and can also transmit the disease. Whirling disease poses no health risk to humans.

Environmental Protection took this action to prevent the transmission of whirling disease to wild trout waters through the aquaculture industry. All stakeholders, including Trout Unlimited, the Alberta Fish and Game Association and a majority of the members of the Alberta Fish Farmers Association, support this measure.

Whirling Disease Distribution Map



The Department is undertaking risk assessments of suppliers to evaluate their disease history, broodstocks, and sources of water and eggs. Favourable results may exempt these suppliers from the ban in the future. For the present, however, the import of live fingerlings to bioassay labs for the monitoring of water quality is the sole exception to the ban. These fish will be confined to laboratory aquariums; once they are destroyed, all remains will be incinerated.

Though previously considered a "hatchery disease, recent studies implicate whirling disease in the significant decline of wild trout populations in Montana, Utah and Colorado. Environmental Protection tested wild trout for the disease in selected tributaries of the Bow, Oldman and Red Deer rivers this past summer. To date, whirling disease has not been reported anywhere in Canada. Further testing of tributaries and provincial broodstations will continue.

To address Whirling disease at a strategic level, a task force has been appointed consisting of 12 members appointed from industry, government and related associations. The two co-chairman are Duane Radford of Alberta Environmental Protection and Duncan Lloyd of Agriculture, Food and Rural Development. An expert panel of six scientists has also been assembled to provide information and advice to the task force.

For more information, contact:
Bev Larson, Fish Pathologist
Fisheries Management Division
Alberta Environmental Protection
(403) 422-4830.

Aeration in my Pond

Winter kill is a common problem faced by pond aquaculturists in Alberta. The same characteristics that produce high growth rates for fish during the summer contribute to the death of fish in winter — namely relatively shallow water and abundant plant growth. In a new pond or dugout, winter kill may not be a problem for the first few years, but once some organic material has accumulated, winter kill is almost inevitable.

Think of ponds and dugouts as very fertile pastures — for fish. Algae and other plant material grows abundantly in this pasture and supports an ecosystem that produces lots of invertebrates and small fish (fathead minnows and stickleback) for trout to eat. Over time, the algae and other organisms die and sink to the bottom of the pond. The breakdown and decay of this material consumes oxygen.

Oxygen depletion starts at the bottom of the pond and works upward. In winter, when the pond is covered with ice, oxygen from the air cannot get into the water. The fish die when decaying material uses up all the oxygen. An external source of oxygen is required to keep fish alive through the winter. Continuous aeration using an electrical air pump works best. Windmills are an option in some parts of the province, but they are a poor choice. In many areas of Alberta, there is not enough constant wind to keep fish alive.

Good aeration does more than provide oxygen for fish to breathe. The oxygen also removes substances, such as ammonia, that are toxic to fish. High oxygen levels in the water near the bottom prevents other substances such as iron, manganese and hydrogen sulfide from coming out of the mud.

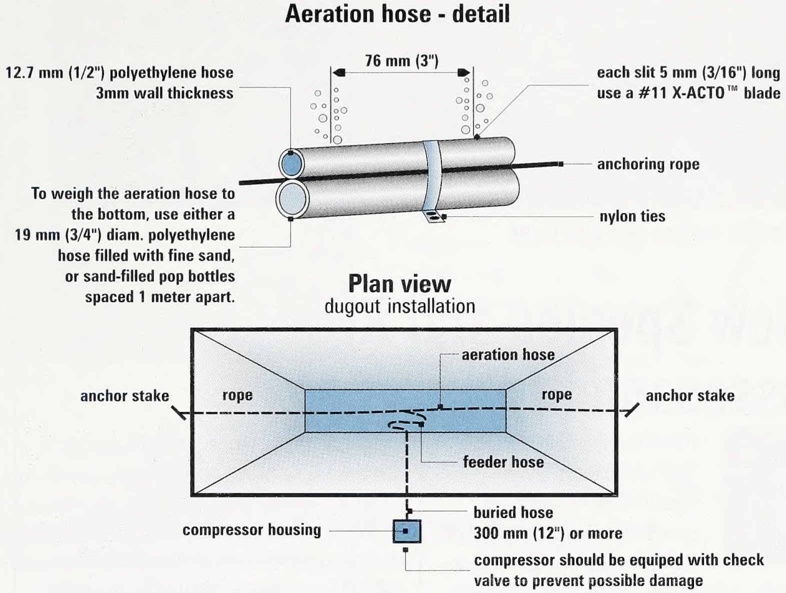

Aeration hose - detail
76 mm (3")
12.7 mm (1/2") polyethylene hose
3mm wall thickness
each slit 5 mm (3/16") long
use a #11 X-ACTO™ blade
anchoring rope
To weigh the aeration hose to the bottom, use either a 19 mm (3/4") diam. polyethylene hose filled with fine sand, or sand-filled pop bottles spaced 1 meter apart.
nylon ties
Plan view
dugout installation
aeration hose
anchor stake
rope
rope
anchor stake
feeder hose
buried hose
300 mm (12") or more
compressor housing
compressor should be equiped with check valve to prevent possible damage

Figure 1. Aeration Device

High oxygen levels should be maintained in the water near the mud. Between 0.5 and 2 cubic feet per minute of air is required to properly aerate a pond of about ½ acre (approx. 100 x 200 feet). Air pumps that use a diaphragm can generate enough air pressure (5 to 10 psi) to work well in ponds that are 3 to 4 meters deep. Small diaphragm pumps manufactured by Gast and Thomas are well made and reliable.

Run the pump continuously, particularly in winter to maintain the life of the diaphragm. Condensation in the air line near the pump can be a problem. To avoid this problem, house the pump in an unheated building and locate either a section of large diameter (1" or more) tubing or a condensation vessel near the pump. If ice or water get into the air line, disconnect the line, pour in a little gas line antifreeze, reconnect and let the air push the antifreeze through the line. Gas line antifreeze usually consists of alcohol, which is not harmful to fish in the quantities required.

Run an air line from the air pump to the pond. If you do not have electricity near the pond, use a long air line. The decrease in pressure and flow of a 1/2" line over 1/2 a mile or more is minimal, up to 1 cfm. Ideally, the line should be buried and sloped towards the pond so that any water in the line will run into the pond. If this layout isn't possible, weekly or bi-weekly treatments with gas line antifreeze will help ensure the line does not plug up with ice.

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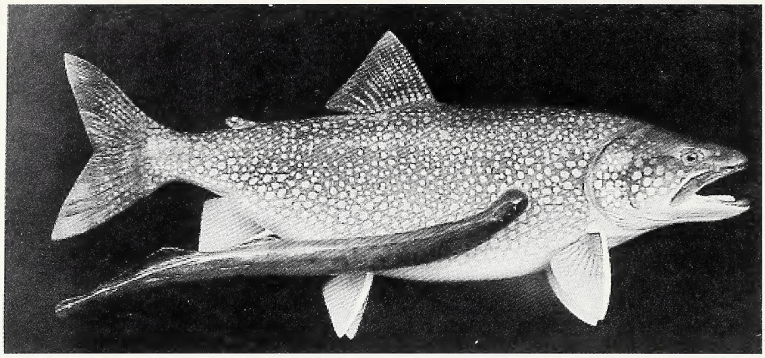


Lamprey feeding on a lake trout.

New Species and Risk Assessment

Introductions of "exotic" fish and invertebrate species into Canadian provinces pose a potential threat to native species in ponds, lakes and rivers. These threats may often extend beyond provincial boundaries when streams flow to neighbouring jurisdictions. The principal areas of concern include:

1. disease risk, ie. direct transfer of new diseases by the target species or the introduction of non-target species to provincial waters,
2. ecological risk, ie. the impact of the new species on the native aquatic plant and animal communities,
3. genetic risks, ie. risks imposed should the new species interbreed with wild stocks; and
4. threatened or endangered species; ie. populations that may be at risk due to exploitation of source species.

Unwanted entry of the sea lamprey into the Great Lakes is only one example of many exotic species that threaten natural ecosystems. These threats can only be lessened by thorough and systematic evaluation of all new species proposed for introduction.

In April 1997, Alberta Agriculture Food and Rural Development (AAFRD) assumed the administration for licencing private and commercial aquaculturists. The AAFRD — Aquaculture Section also acquired the responsibility to conduct risk assessments on any new potential aquaculture species.

In July 1997, AAFRD (Aquaculture Section) and Alberta Environmental Protection (Fisheries Management Division) formed a provincial Aquatic Introductions and Transfers Committee (Risk Committee). This committee has proposed a "Risk Assessment Process' for Alberta, consistent with the National Policy on Introductions and Transfers of Aquatic Organisms. However, unlike the National Policy, the committee has recommended a two-level risk assessment process (Level 1 and Level 2). In this way, timely decisions on species introduced for research and/or the food market may be reached by less complex and costly mechanisms (Level 1 risk assessment).

This two-level approach will not compromise the intent of the National Policy or impose negative effects of new species introductions. It will provide a rigorous review of risk concerns for proposed species introductions. Under the planned procedure, all proponents will submit a draft business production plan or research proposal as part of the application process. Supporting this must be documentation on genetics, life history, diseases history, and habitat and rearing requirements of the proposed species.

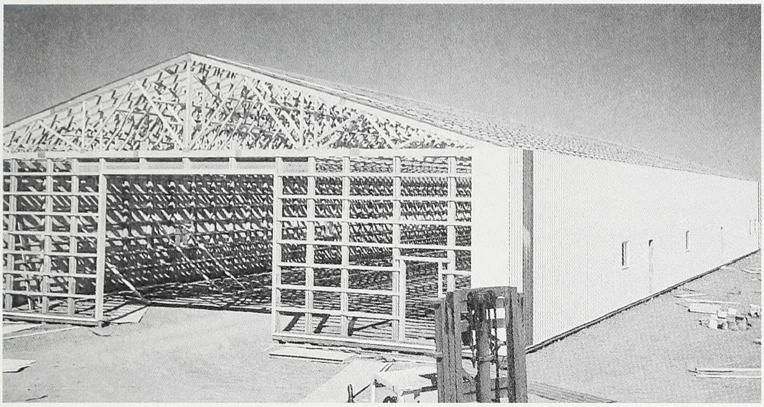
Proponents may contact the Aquaculture Section of AAFRD to receive an application form and required format for developing the document.

This information will allow the Risk Committee to critically evaluate potential risks of negative affects to wild fisheries resources, habitats and the aquaculture industry. All risks are weighed against the economic and social benefits of the proposed introduction. According to Ron Beck, senior biologist with AAFRD's Aquaculture Section and a risk committee member, "Anyone wanting to introduce new aquatic species not currently listed under the Ministerial Regulations of the Alberta Fisheries Act (1997) must follow the protocol for introductions as outlined in the risk process."

The Risk Committee recognizes that many species proposed for introduction have the same degree of risk, whether they are introduced into Ontario or Alberta. Therefore, attempts are being made to coordinate efforts with other provinces by developing a "Risk Model" that will reduce duplication of effort and share common resources. "Hopefully" adds Ron Beck, "the model we are proposing will meet these goals."

Additional information on risk assessment and the introduction of new aquatic species can be obtained by contacting Ron Beck, Senior Biologist with AAFRD's Aquaculture Section, at (403) 381-5573, Lethbridge.

Grass Carp for Dugout Weeds (cont'd)



EID aquaculture facility in Brooks.

AAFRD has to be assured that fish escape is not possible. Thus, the water body cannot be located in a 1 in 100 year flood zone. All water inlets and outlets must be screened. Once you are a licenced recreational fish farmer and allowed to stock triploid grass carp, the EID can be contacted to arrange a delivery date. It is recommended that the water be well aerated and safe from predators like pike, blue herons, and cormorants.

For more information on ordering triploid grass carp, contact Terry Shroeder, at the Eastern Irrigation District phone **(403) 362-1400** or e-mail carp@eid.awinc.com.

To obtain details on licencing requirements for placing triploid grass carp in your dugout, contact Jack Stewart, head of licencing and inspection, Aquaculture Section, Animal Industry Division, Alberta.

A fact sheet on grass carp is available at your nearest district office of AAFRD. Ask for Agdex 485/641-1 *Biological Weed Control in Alberta Using Triploid Grass Carp*.

Aeration in my Pond (cont'd)

The final component of a good aeration system is a diffuser. A diffuser is any device that breaks the air up into small bubbles. Small bubbles transfer oxygen to water and circulate the water better than larger bubbles. The diffuser should be located at the bottom in the deepest part of the pond. One of the most effective diffusers is called a linear diffuser. This can be made of polyethylene- plastic tubing, with weights to keep the tubing on the bottom.

A simple linear diffuser can easily be home crafted. Slits or holes are necessary to break the air up into fine bubbles. This is done simply by inserting an X-ACTO™ knife lengthwise into the tubing making a 3/16" wide slit. Space each incision every 3 to 4" along the same side of the tubing. An economical method to weigh down the tubing is using sand-filled pop bottles tied onto the tubing at 1 meter intervals. Twenty to twenty-five feet of tubing is sufficient for a pond of about ½ acre.

Other types of diffusers can be used, such as large air stones and membrane diffusers. When first installed, all diffusers are effective for mixing and gas exchange, but some will require more maintenance than others over the long term. There are two main criteria on which to judge diffusers: 1) mixing and gas exchange and 2) maintenance. The important thing for keeping your fish in good condition this winter is to maintain continuous aeration with some sort of diffuser.

For more information about winter aeration or obtaining equipment contact: Bill Mackay at Prairie Dugout Supplies (Phone 227-3563, fax 227-3812) or John Bjornson at Alberta Trout Growers (phone 662-3474, fax 662-3423).

You can also contact AAFRD's aquaculture engineer, Svat Jonas, P.Eng., in Lethbridge at (403) 381-5870, one of our regional engineering technologists or one of PFRA's district water program heads.

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Courses, Publications & Events

Courses

AAFRD, in conjunction with Lethbridge Community College and the Alberta Fish Farmers Association, is offering three aquaculture courses in 1998. These include:

Basic Principles of Aquaculture
February 26-28 at the Camrose Exhibition Facility

- this targets individuals interested in investigating fish culture for recreational or commercial purposes. It provides an overview of aquaculture regulations, marketing, culture and handling techniques, water quality, equipment, nutrition, and feeding.

Brood Stock Management
March 26-28 at TBA

- designed for current and potential commercial producers. The course will cover egg stripping, egg incubation and larval husbandry, manipulation of fish to produce sterility, and brood fish conditioning and spawning.

Fish Pathology
Fall 1998

- is a course on basic pathology, diagnostics procedures and treatment techniques of cold and warm water fish diseases frequently encountered in aquaculture operations.

There is limited enrollment for each course. Please register early by phoning the Lethbridge Community College toll free at 1-800-572-0103.

For more information on aquaculture courses, contact, Eric Hutchings, Aquaculture Section, Agriculture, Food and Rural Development, (403) 381-5574.

Publications

A number of aquaculture publications are available on short-term loan through your local AAFRD office. Most are located at the Lethbridge Regional Library maintained by the Aquaculture Section. Bev Brezina, Lethbridge Regional Client Services Representative, manages this library and can be contacted at (403) 381-5131.

Texts and papers on aquaculture engineering, fish genetics, carp culture, eel, tilapia and sturgeon culture are accessible.

Fact sheets from the AAFRD office nearest you include:

- *Biological Weed Control in Alberta using Triploid Grass Carp, Agdex 485/641-1*
- *Freshwater Aquaculture Industry/ Ag-Ventures series Agdex 485 /830-1 (under review).*

Events

February 15-19, Aquaculture '98 at Bally's, Las Vegas, Nevada.

International triennial conference and exposition of World Aquaculture Society, National Shell Fisheries Assoc. and American Fisheries Society, telephone (425) 485-6682, fax (425) 483-6319 or e-mail to worldaqua@aol.com.

March 6-8, 1998, Fish Canada '98 at the Moncton Coliseum/Agrena Complex in Moncton, New Brunswick, Canada.

Contact Bob Dummington, manager by phone (506) 757-8936, fax (506) 757-8217 or e-mail to denman@ns.sympatico.ca

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Editor's Notes

Aquaculture in Alberta is planned for circulation three times a year.

To maintain reader interest, we need to report on timely issues. In the next Spring issue, we hope to carry information on "who's who" in the local fingerling supplier list, how to deal with predators, and aquaculture information that can be found on the Internet. Your comments, concerns and suggestions are necessary!

If you would like to submit articles or provide us with input, feel free to contact Eric Hutchings, the editor, by phone in Lethbridge at (403) 381-5574 or email @hutchin.gov.ab.ca

Copies can be obtained on the internet from the Department of Agriculture's Home Page at http://www.agric.gov.ab.ca/livestock/aquaculture/index/html

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